SHORT RANGE TV TRANSMITTER
(AMATEUR TV TRANSMITTER)

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UNIVERSITI MALAYSIA SARAWAK

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Judul: **SHORT RANGE TV TRANSMITTER (ATV TRANSMITTER)**

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SUKRI BIN SHEIKH SALIMULLAH

Tesis Dikemukakan Kepada
Fakulti Kejuruteraan, Universiti Malaysia Sarawak
Sebagai Memenuhi Sebahagian daripada Syarat
Penganugerahan Sarjana Muda Kejuruteraan
Dengan Kepujian (Kejuruteraan Elektronik dan Telekomunikasi)
2002

Untuk ayah, ibu, dan abang-abang tersayang.

PENGHARGAAN

Dengan Nama ALLAH Yang Maha Pemurah Lagi Maha Mengasihani. Segala puji dan syukur dirafa'kan ke hadrat-Nya kerana dengan izin-Nya, projek ini dapat dilaksanakan serta diselesaikan dengan baik.

Di sini, penulis ingin merakamkan penghargaan ikhlas kepada penyelia tesis. En. Wan Azlan di atas segala bimbingan, perbincangan, sokongan, di samping komitmennya sepanjang penyelidikan tesis ini.

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Penghargaan juga ditujukan kepada mana-mana pihak yang membantu dalam projek ini sama ada secara langsung atau tidak.

ABSTRACT

Amateur TV Transmitter (Short Range) is actually a kind of broadcasting equipment that is very useful for broadcasting event involving a coverage area of less than 10 miles and on the other hands, it is portable and this will make the process of assembling the equipment becoming much faster. The frequency being used is in the UHF (Ultra High Frequency) range, 477.25 MHz based on the crystal that is used and at frequency which would not interfere the commercial broadcasting frequency through negotiation with the Malaysia Radio and Television (RTM). For the usage in UNIMAS, this system may be used for live telecast (wireless) during the Convocation event to the Lecture Hall 1 (DK1) so this will enable other students to see the event. Besides, this system could also be applied to remote control aircraft and unmanned car, as the visualization agent.

ABSTRAK

Pemancar TV Amatur (Jarak Dekat) adalah merupakan sejenis peralatan sistem pemancar siaran yang amat berguna bagi penyiaran yang melibatkan satu kawasan liputan yang kurang daripada 10 batu serta antara lainnya, mudah untuk dibawa dan ini mempercepatkan proses persediaan penyiaran. Frekuensi yang digunakan adalah dalam julat *UHF* (Frekuensi Ultra Tinggi) iaitu 477.25 MHz berdasarkan kepada nilai kristal yang digunakan dan pada frekuensi yang tidak akan mengganggu frekuensi penyiaran komersil melalui perundingan dengan pihak RTM. Dari segi penggunaannya di UNIMAS, sistem ini boleh digunakan bagi penyiaran siaran langsung Majlis Konvokesyen (tanpa wayar) ke Dewan Kuliah 1 agar para pelajar yang lain dapat menyaksikan majlis konvokesyen. Selain itu, sistem ini boleh diaplikasikan kepada pesawat kawalan jarak jauh mahupun kereta tanpa pemandu sebagai 'agen' penglihatan.

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CHAPTER 1

ELECTRONIC COMMUNICATIONS

1.1 INTRODUCTION

In the technology era nowadays, communications is one of the most pervasive human activities. Communications has become the most prominent matter in life as new technologies have been developed such as the telephone and the telegraph especially whenever distance communication is required for airplane.

In the twentieth century, communication equipments have increased our ability to communicate. Through communication technologies, it has ease our life in many aspects especially whenever in the recent years, more radio or wireless applications have been developed.

Due to the enhancement in the semiconductor industry, sophisticated portable equipment for wireless communication and computing can be developed.

1.2 THE IMPORTANCE OF COMMUNICATIONS

Communication is the basic process of information exchange; something that human being does most of time. Communication lead to the understanding of the second party in order to receive the message which can be shown through signal or body language, facial expression. Although the bulk of human communication today is still oral, a huge volume of information is exchanged by means of the written word.

As we all know, the main barriers to communication between human are language and distance. When human of different races, tribes or nations come together, a problem regarding the language will arise and can only be overcome people learn the languages of others and can serve as interpreter.

Once upon a time ago, the communication between two parties, sometimes were using drums or smoke signals. In addition, a signal fire, blowing a horn or waving a flag a part of long distance communication.

In the late nineteenth century, whenever the electricity was discovered, many applications were explored. The telegraph and the telephone were invented in 1844 and 1876 respectively. Radio was invented in 1887. The sequence of the electronic and human telecommunication milestone is as below:

1440	Gutenberg invents the printing press
1844	Morse patents the telegraph
1866	First successful use of a transatlantic telegraph cable
1876	Bell invents and patents the telephone
1879	Eastman develops photographic film
1887	Hertz discovers radio waves
1895	Marconi demonstrates wireless telegraphy
1901	Marconi makes first transatlantic radio transmission
1902	The Fleming "valve" is invented
1906	De Forest invents the triode vacuum tube and the first radiotelephone broadcast
1923	Television is invented
1931	Radio astronomy is discovered
1940-45	Radar is perfected and helps win World War II
1948	The transistor is invented
1950s	Cable television first appears
1954	Color television broadcasting begins
1959	The integrated circuit is invented
1962	First communication satellite
1969	The internet is invented
1975-81	Personal computers come into use
1981-85	Modems in PCs become widespread
1983	First cellular telephone system becomes operational
1989	The GPS is used for commercial and personal applications
1989	The World Wide Web is invented
1998	The first commercial use of digital/high-definition television takes place

Fig 1.1 Time line of milestone in human and electronic communication

After all, the new-era communication equipments have play it major role in order to increase people's ability to share information. For instance, e-mail is one of the elements that could allow individuals with PCs to communicate with others over networks at anywhere.

Through internet, any information that is required could be obtained that is brougbt to the user via the communication networks. All information are at our fingertips and this change the buying habits and methods as well as the way to get information.

We won't know how our live will be if we don't have any knowledge and information from around the world through electronic communication. It seems that this kind of communication is playing its major role in today's life.

1.3 THE ELEMENTS OF A COMMUNICATION SYSTEM

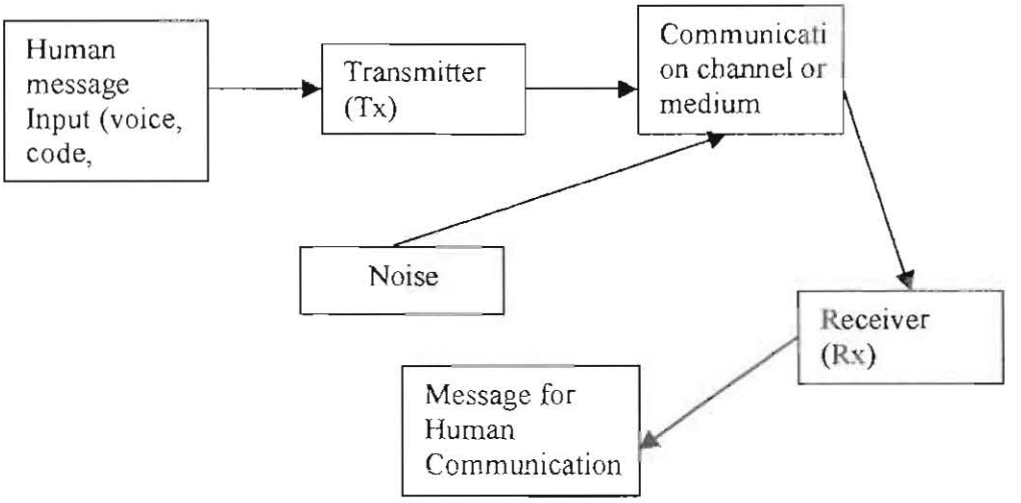

Fig. 1.2 The basic elements of any communication system.

All electronic communication systems have the basic form as shown above that consist of a transmitter, a communication channel or medium, and a receiver. The input information is mostly from human and this input is also called as intelligence signal. The signal is being inputted to the transmitter which then transmit the message over the communication channel. The receiver will pick up the message and it will be relayed to another human. Noise is an element that is applied to any interference that degrades the transmitted information.

1.3.1 Transmitter

A transmitter is designed to convert the information into a signal for transmission over the communication medium and it might be a microphone up to a microwave radio transmitter.

1.3.2 Communication Channel

A medium for the electronic signal being sent from one place to another. It may be as simple as a pair of wires that carry a voice signal from a microphone to a headset. The communication medium may also be a fiber-optic cable.

In addition, the medium may be wireless or radio. Radio makes use of electromagnetic spectrum where signals are communicated from point to point by converting them into electric and magnetic fields that propagate readily over long distances.

Although the medium suports the transmission of information, it also attenuates it . At the receiver, the signal appear much lower in amplitude due to the degradation of signal. Considerable amplification of the signal, both at the transmitter and the receiver, is required for successful communication.

CHAPTER 2

TELEVISION TRANSMISSION

2.1 TELEVISION BROADCASTING

Broadcast means send out in all directions. The receiving antenna will pick up the electromagnetic radio waves radiate by the transmitting antenna as shown in Fig. 2.1. The television transmitter has two functions, visual and aural (audio) transmission. From the radiating antenna, both the FM sound signal and the AM picture signal are emitted.

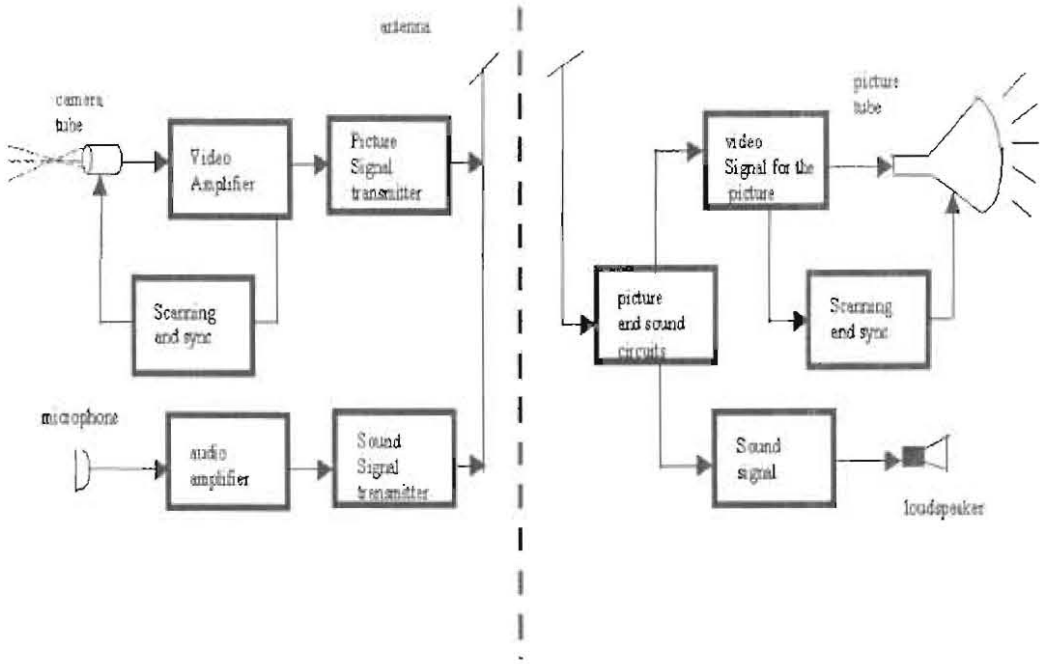

Fig 2.1 : TV Broadcasting System Block Diagram

In visual transmission, the camera tube converts the light image to a video signal. The cathode ray tube (CRT) with a photoelectric image plate and an electron gun enclosed in a vacuum glass envelope is actually the camera tube. The vidicon is a common type of camera. Basically the camera tube takes an optical image of the scene on its photoelectric image plate, which is scanned in horizontal lines by the electron beam. The scanning goes from left to right and top to bottom, as viewed by the camera. The entire picture frame, comprising a total of 525 scanning lines takes 1/30 s to scan. Hence, a sequence of electrical variations is the output of the camera tube which corresponds to the picture information (video signal).

The video signal is amplified, and synchronising pulses are added. Amplitude modulation of the picture carrier results in AM picture signal.

In color television, the system use a color camera and a color picture tube. The video signals for the red, blue and green information are provided by the color camera. Similarly, the image in green, red and blue, with all their color mixtures including white are reproduce by the color picture tube. For video and audio signal transmission, the band of frequencies used is called a television channel. A 6MHz wide channel with a specific carrier frequency is assigned to each television station by the Federal Communications Commission (FCC).

Opposite polarity represent the video signal variations correspond to visual information, with black and white. Fig. 3.2 shows a video signal as a result of a black and white picture being scanned which is called as the luminance or the Y signal.

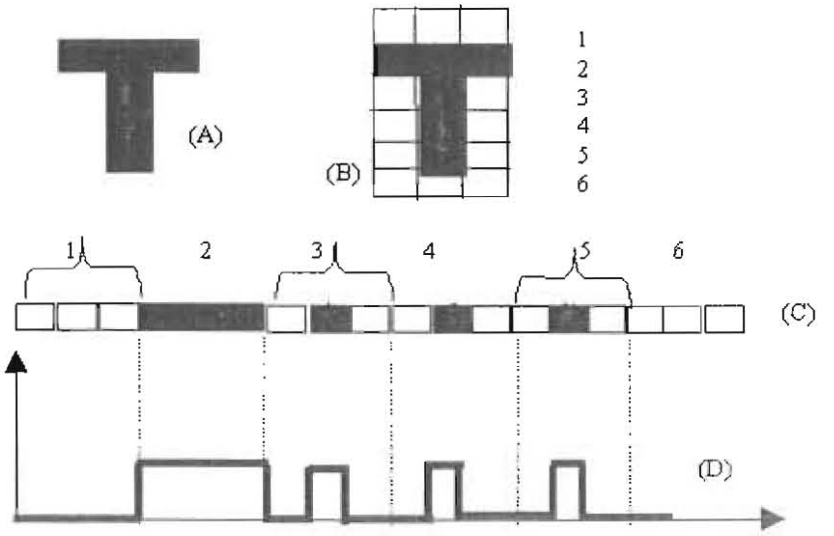

Fig. 2.2:
(A) Scene to transmit (B) Scene on camera screen (C) Scene scanned sequentially (D) Resulting electrical signal

2.2 VIDEO MODULATION

For the picture carrier signal, the 6MHz bandwidth is mainly needed. The video signal with a wide range of video frequencies up to approximately 4MHz modulate the amplitude of the carrier signal. The highest video modulating frequencies of 2 to 4 MHz correspond to the smallest horizontal details in the picture.

2.3 CHROMINANCE MODULATION

The color information for broadcast in color is contain in the 3.58MHz chrominance signal. In order to form one video signal that modulates the picture carrier wave for transmission to the receiver, the color signal is combined with the luminance signal. C signal or the chroma signal is another name for the chrominance signal.

2.4 THE FM SOUND

Associated sound or the sound carrier signal for the picture also included in the 6 MHz channel. The audio frequencies which are in the range of 50 to 15000 Hz modulating the sound carrier. This audio frequency range is the same as that for stations in the commercial FM broadcast band of 88 to 108 MHz. In the TV sound signal, the maximum frequency swing of the carrier is $\pm$ 25 kilohertz (kHz) for 100 percent modulation. This swing is less than the $\pm$ 75 kHz for 100 percent modulation in the commercial FM broadcast band. The FM sound system has all the advantages compared with AM, including less noise and interference.

AM is better for the picture signal because the ghosts resulting from multipath reception are less obvious. By using the FM system, the ghosts will flutter compared to AM.